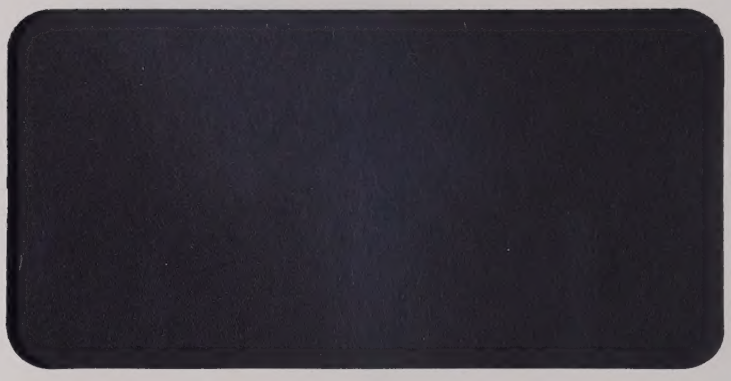
SERVICING AND MAINTENANCE MANUAL

MG 'C' VERSIONS 200 WATT

ADVANCE
POWER SUPPLIES



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INTRODUCTION

The Gould MG family of power supplies is a range of very compact units employing direct-off-line switching techniques in order to reduce physical dimensions to a minimum.

The range is available in four different power levels from 100W to 500W. At each power level, units are available with various combinations of output voltage and current. Output voltages are adjustable ±5% by means of screwdriver adjustments on the front panel. Facilities are provided for local or remote sensing and for voltage programming by means of an externally connected resistor.

All units are provided with constant current protection against overloads or short circuits; also with overvoltage protection by means of automatic control circuit shut-down.

Particular attention has been paid in the design stage to minimise the interference that might otherwise be caused by the switching action of the power supply circuits. In this respect sample units have met the requirements of VDE 0871 Curve 'A' and BS800 Part 3.

The units are fitted with standard soft-start facilities to reduce input current surges at switch-on.

All dual input MG units are UL and CSA recognised.

SPECIFICATION

Note 1. Input current measured at rated output load and nominal input voltage of 115V or 240V. RMS current approx. inversely proportional to input voltage. Repetitive peak current approx. constant with input voltage.

Note 2. Output voltages are adjustable ±5% by means of front panel potentiometer.

Note 3. For non-5V units the specification is guaranteed at the lower power rating of the given case style, e.g., MG12-10C is fitted into case Style A which is rated at 100/120W and has the specified hold-up performance up to 12V +5% at 8.33A.

Output Voltage Regulation

0.1% maximum for a worst case combination of 0-100% load change and a ±10% line change within the rated input voltage range.

Ripple and Noise

10mV rms 50mV pk-pk (30MHz bandwidth).

Temperature Coefficient

Less than ± 0.01%/^{o}C.

Temperature Range

$-10^{o}C$ to $+70^{o}C$, derating from $50^{o}C$ at $2\frac{1}{2}\%/^{o}C$.

Overload Protection

Constant current settings see Specification Table.

Overvoltage Protection

Electronic overvoltage protection shuts down the output if output voltage exceeds the level shown in the Specification Table.

Efficiency

Typically in excess of 70%.

Series and Parallel Operation

There is no limitation on parallel operation of MG units. Series operation is permissible to a maximum total voltage of 250V.

Remote Sensing

Remote sensing is available from front panel terminals. Total voltage drop should not exceed 5V maximum in each lead. Refer to the hold-up characteristic curves for limitations.

Remote Programming

Output voltage may be programmed from 20%Vo upwards on MG units by means of a programming resistor on front panel. Programming resistance is 1000Ω /Volt ±1%.

Remote Shutdown

Output voltage may be shut down by connecting a short circuit between terminals 1 and 6 of programme terminal block. On the 500W units, output may also be shut down by means of a fully-floating opto-isolated 5V TTL-compatible high signal of typically 20mA.

Soft-Start and Switch-On Time

The units are fitted with an input inrush current limiting circuit. This delays the availability of output voltage. See Table 1 for specific values of current and time.

Transient Response

For step load changes of 10-100% or 100-10%, voltage deviations are typically 500mV and the output voltage returns to within the regulation band in approx. 2mS.

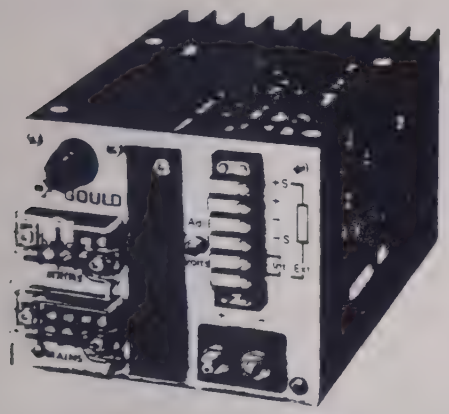
Indicators (500W Units Only)

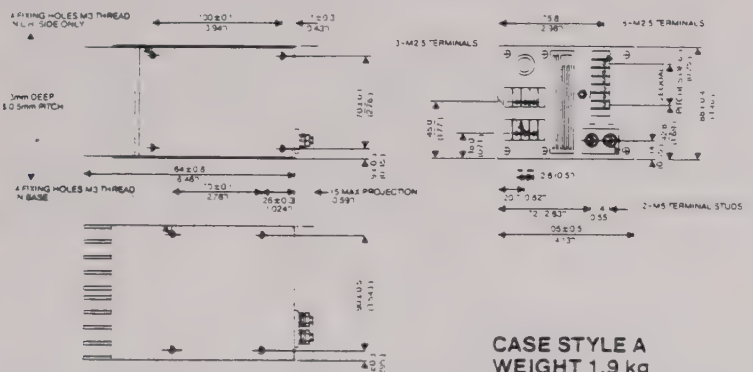
Overvoltage and overcurrent are indicated by LED's on the front panel.

SPECIFICATION TABLE

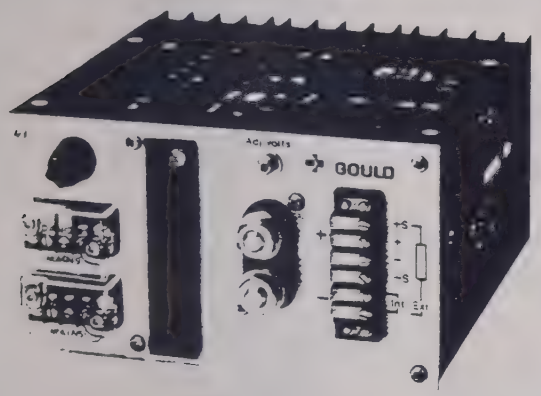
Type No.	MG5-20C	MG5-40C	MG5-60C	MG12-10C	MG15-8C	MG24-5C
Input Voltage Range +10% -20% 45-440HZ	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link
Input Currents (typical) (See Note 1)	115V/ 120V 220V/ 240V	115V/ 120V 220V/ 240V	115V/ 120V 220V/ 240V	115V/ 120V 220V/ 220V	115V/ 120V 220V/ 220V	115V/ 120V 220V/ 220V
RMS	1.7A 1.0A	3.2A 1.6A	4.75A 3.0A	1.7A 1.0A	1.7A 1.0A	1.7A 1.0A
Repetitive Peak	4.5A 3.0A	7.0A 5.0A	11.0A 7.5A	4.5A 3.0A	4.5A 3.0A	4.5A 3.0A
Switch On Peak	12	36	40	12	12	12
Switch On Time	120 msec	120 msec	120 msec	120 msec	120 msec	120 msec
Output Voltage (V)	5V	5V	5V	12V	15V	24V
Output Current (A)	20A	40A	60A	10A	8A	5A
Current Limit Settings	>21.4 <22.5	>42.8 <45.2	>64.2 <67.8	>10.7 <11.3	>8.56 <9.04	>5.25 <5.75
Overvoltage Protection Levels (%)	120 to 130%	120 to 130%	120 to 130%	115 to 125%	110 to 120%	110 to 120%
Case Style	A	B	C	A	A	A

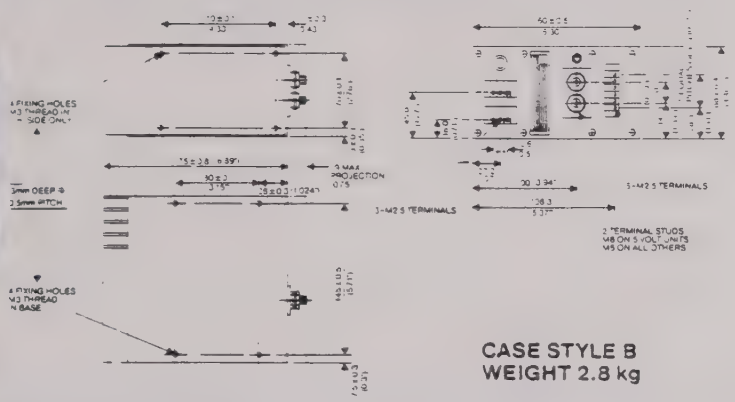
Type No.	MG15-16C	MG24-10C	MG24-15C	MG5-100	MG12-43	MG15-34	MG24-21
Input Voltage Range +10% -20% 45-440HZ	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V or 220 to 240V by front panel link	115 to 120V o 220 to 240V b front panel link
Input Currents (typical) (See Note 1)	115V/ 120V 220V/ 240V	115V/ 120V 220V/ 240V	115V/ 120V 220V/ 240V	115V/ 120V 220V/ 240V	115V/ 120V 220V/ 240V	115V/ 120V 220V/ 240V	110V/ 115V 220V/ 240V
RMS	3.2A 1.6A	3.2A 1.6A	4.75A 3.0A	7.6A 4.0A	7.6A 4.0A	7.6A 4.0A	7.6A 4.0A
Repetitive Peak	7.0A 5.0A	7.0A 5.0A	11.0A 7.5A	17.0A 10.0A	17.0A 10.0A	17.0A 10.0A	17.0A 10.0A
Switch On Peak	30	30	40	30	30	30	30
Switch On Time	120 msec	120 msec	120 msec	1000 msec	1000 msec	1000 msec	1000 msec
Output Voltage (V)	15V	24V	24V	5V	12V	15V	24V
Output Current (A)	16A	10A	15A	100A	43A	34A	21A
Current Limit Settings	>16.8 <18.4	>10.7 <11.3	>15.75 <18.4	>111.5 <113.5	>47.8 <48.9	>37.8 <38.6	>23.3 <23.8
Overvoltage Protection	110 to 120%	110 to 120%	110 to 120%	120 to 130%	115 to 125%	110 to 120%	110 to 120%
Case Style	B	B	C	D	D	D	D



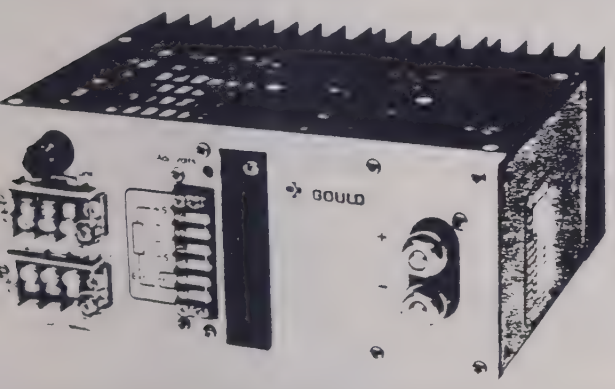


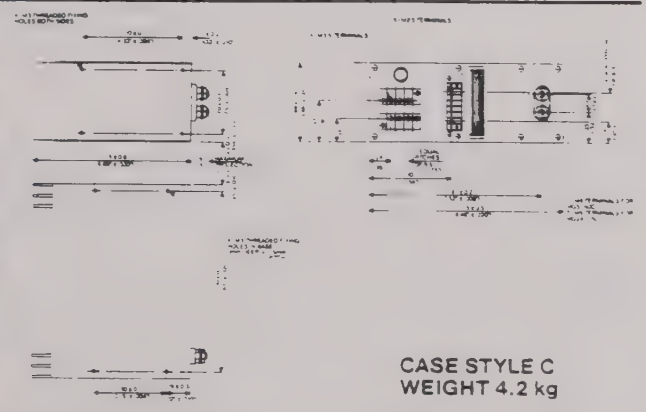
CASE STYLE A
WEIGHT 1.9 kg



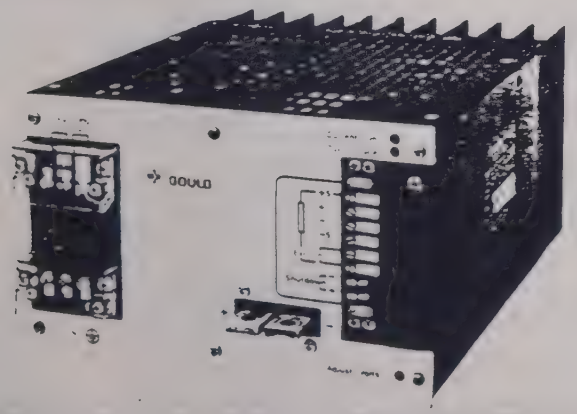


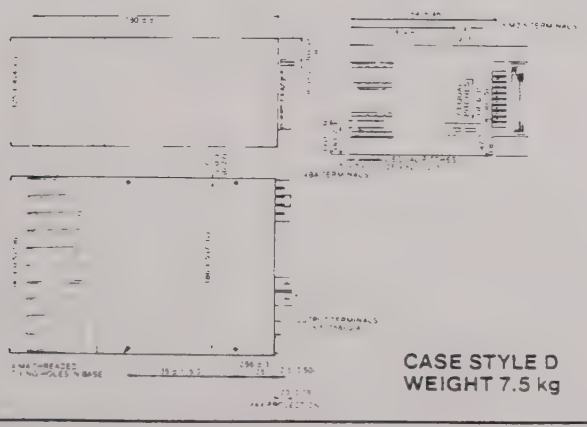
CASE STYLE B
WEIGHT 2.8 kg





CASE STYLE C
WEIGHT 4.2 kg





CASE STYLE D
WEIGHT 7.5 kg

Insulation (100W & 200W Units)

Between AC input and all output terminals and case connected together, tested to 2.1KV DC for one minute. Between each DC output and case,±250V DC continuous, tested to 500V DC for one minute. These tests are not repeatable as they may damage insulation materials.

Insulation resistance not less than 50 MΩ at 500V DC input-to-ground and output to ground.

Insulation (300W & 500W Units)

2.5 Kv rms input to output for 60 sec.; consisting of 1.5 rms input-to-ground and 1 Kv rms output-to-ground. This meets the requirements of VDE 0730. Insulation resistance not less than 50 MΩ at 500V DC input-to-ground and output-to-ground.

OPERATION

Grounding

MG 300W and 500W units should be permanently grounded.

Input Voltage Connection

The AC supply input to the unit is connected to the terminal block on the left of the front panel. The terminals are marked L (Line), N (Neutral), E (Earth). A transparent safety cover is provided.

Input Voltage Tap-Changing

With the exception of the 300W units a dual input MG can be charged from 115/220V to 220/240V operation by moving a single link on the front panel and on the 500W unit, changing the fuse rating as specified.

On the 300W MGC units to convert from 220/240V to 110/120V operation all three terminals on the upper terminal block must be connected with the two links supplied; the fuse rating must also be changed as specified.

Output Characteristics

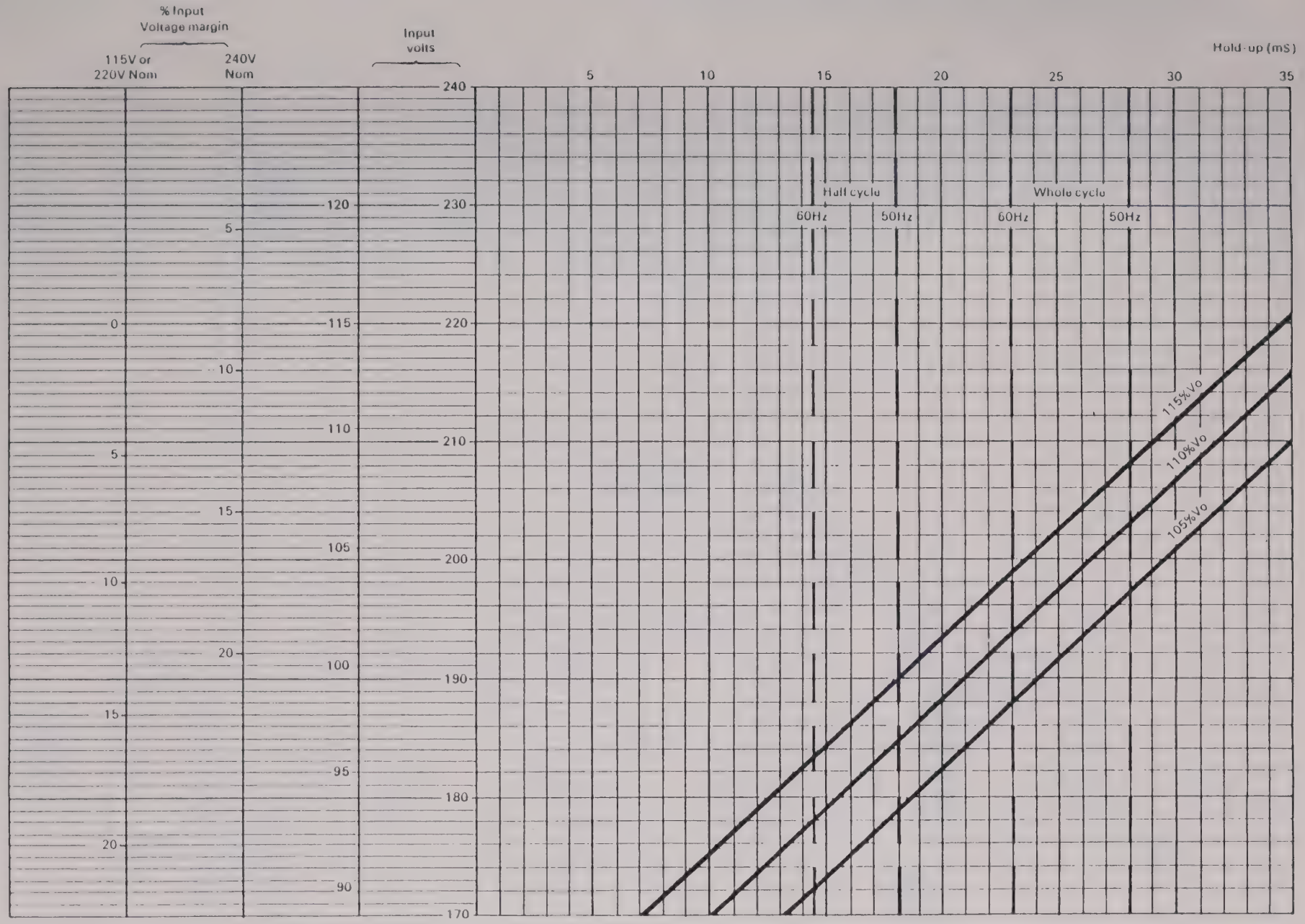
The design concept of switching power supplies makes it possible to trade-off three fundamental aspects of the specification against each other:

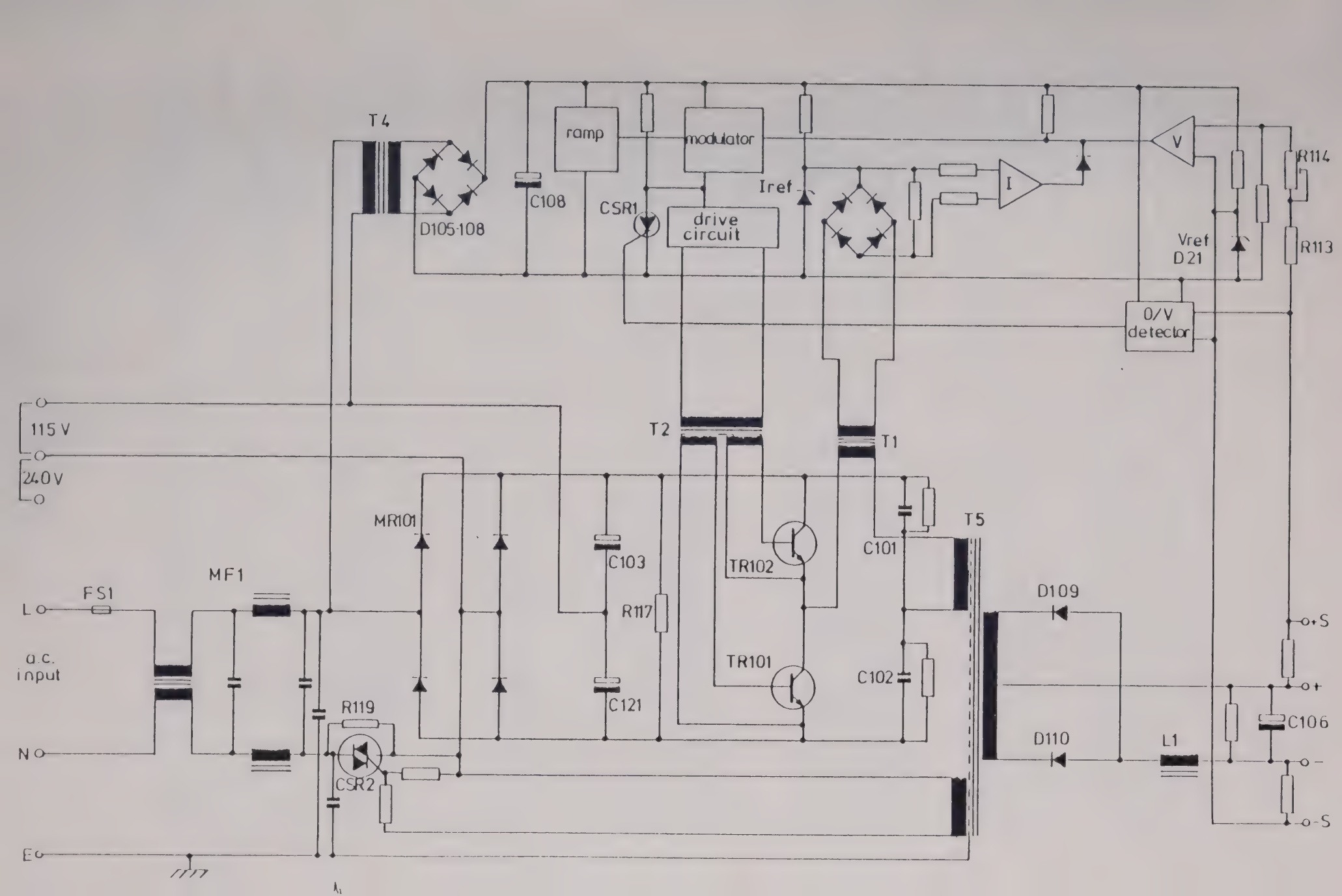
(1) input power failure hold-up time;

(2) negative input voltage margin;

(3) output voltage (including lead voltage drop).

The MG series is designed for a 28mS hold-up time at an output voltage of 105% of specification at 10% below nominal input voltage.


% Input
Voltage margin
115V or
220V Nom
240V
Nom
Input
volts
Hold-up (mS)
5
10
15
20
25
30
35
240
230
220
210
200
190
180
170
120
115
110
105
100
95
90
5
0
10
5
15
20
15
20
Half cycle
Whole cycle
60Hz
50Hz
60Hz
50Hz
115%Vo
110%Vo
105%Vo


T4
D105-108
C108
ramp
modulator
Iref
CSR1
drive circuit
I
V
R114
R113
Vref D21
0/V detector
115 V
240 V
T2
T1
T5
MR101
C103
C121
R117
TR102
TR101
C101
C102
D109
D110
L1
C106
FS1
MF1
L
a.c. input
N
E
R119
CSR2
+S
+
-
-S

Example:

Referring to the graphs: An MG5-20C operating on 220V AC nominal is required to provide 5V into a load with a 0.5V total lead drop, i.e., 110% voltage at the power supply terminals. Under these conditions the unit may be operated down to 8% below nominal input voltage with 28mS hold-up (whole cycle missing) or down to 16.5% below with 18mS hold-up (half cycle missing).

Output Connections

The output is available at the large studs on the front panel, the terminals being identified + and - respectively. Wiring to the load should be such as to ensure that lead voltage drop does not exceed the level determined from fig.1. See fig. 2 for required cable size.

Remote Sensing

The remote sensing terminals are located on the 6 or 8 way terminal blocks on the front panel. To operate the unit under remote sense conditions, remove the links connecting +S to +, and -S to -. Then connect +S to -S to the remote points where the regulated voltage is required. It is good practice to run the sense leads as a twisted pair or, under extreme conditions, in a screened cable. Remote de-coupling may also be necessary.

External Voltage Programming

Output voltage may be programmed remotely by removing the link marked 'INT' on the 6 or 8 way terminal block and inserting a programming resistor between the lower terminal of 'INT' and '+S'. (It may be necessary to fit a compensating capacitor across this resistor in some circumstances. For specific cases consult the manufacturer.) It is not necessary to remove the link between +S and + unless remote sensing is also being used.

Mounting

Four M3 or M4 threaded holes are provided in the base of the unit and, on some units, in one of the side panels. If it is necessary to mount the unit from the other side, or from above, the unit may be operated in the inverted position without limiting any area of the specification.

Cooling

The power supply is convection cooled and under normal operating conditions does not require forced air cooling. The mounting method should allow free passage of air through the unit. This is particularly important in the area of the heatsinks. Units may be mounted adjacently without limitation.

CIRCUIT DESCRIPTION

General

The following describes in general terms the operation of the MG circuit with reference to the block diagram. Apart from minor differences, the basic circuit is common to all units.

The circuit consists of an input filter MF1, and a bridge rectifier MR1 followed by a reservoir capacitor C103 and CR1. For 115/120V units the rectifier is connected as a voltage doubler followed by a pair of series-connected reservoir capacitors. All units have an inrush current limiting circuit in series with the AC line or the DC connection to the reservoir. The resulting unstabilised voltage of approx. 350V is used as the power rail for a regulated DC-DC converter operating at a frequency of approx. 33 KHz. The converter (TR101,TR102, C101, C102, T5) is of the half-bridge, pulse-width-modulated type. Two parallel converters are used in the 500W units. The converter output is rectified by the push-pull rectifier stage D109, D110 and smoothed by the low-pass filter L1, C106 to produce the required output voltage.

300W MG 'C' Models - Input Rectifier and Soft Start

D101-D104 are connected either as a full wave bridge rectifier or a full wave doubler/rectifier supplying capacitors C303 and C321 with their bleed resistors R117 and R119. T304 is a small 50/400Hz transformer which generates an auxiliary voltage across C308. CSR 301 is a triac connected across R123 or R122, depending whether the links for 110/120V operation are fitted. CSR/01 is in series with the AC line. After C308 has charged up and the oscillator starts, CSR301 is turned on by the winding on T305 shorting out the soft start resistor R123 or R122.

500W Input Rectifier and Soft Start

D501-504 can be connected either as a bridge rectifier or as a full-wave doubler/rectifier by moving the link on terminal block TB4, located on the front panel. They supply the reservoir capacitors C501 and C502 with their bleed resistors R507 and R508. T3 is a small 50/400Hz transformer which provides power to the control circuits and also via MR301 and C303 to the soft-start circuit. At switch-on, resistors R503-506 are included in series with the AC line and limit the inrush current. Initially, the triac CSR501 is held off by transistor TR301 which is held in saturation by R303. After a specified time controlled by the CR network R304 and C302, enough voltage is established to overcome the trigger level of diodes CSR302 and CSR303. This turns on TR302, which turns off TR301 and allows the voltage on C301 to rise until it turns on the triac CSR501 through trigger diode CSR/01. C301 maintains the conduction of CSR501 during missing AC cycles. At the same time that CSR501 is turned on, transistor TR303 is also turned on, which sends a signal via the opto-couple OC301 to the control circuits to allow the converter to start up.

100W/200W Converter and Control Circuits

Transistors TR101 and TR102 together with capacitors C101 and C102 form a 'half-bridge converter'. The incoming DC power line of approx. 350V is split by capacitors C101 and C102 into ±175V and transistors TR101 and TR102 alternately connects the primary of transformer T5 to the +175V and -175V lines. This creates an AC waveform of 175V peak at the primary which is transfored down to the required level at the secondary of T5. Transformer T1, which is in series with the flow of AC current, is a current transformer which is used for overload detection and protection. The control circuit consists of a fixed-frequency, free-running multivibrator comprising transistors TR1 and TR2, capacitors C2 and C3, diodes D1 and D2 and resistors R1-R4, R46 and R47. The time constants of this circuit are designed so that triangular ramp

voltages appear at the collectors of TR1 and TR2 and these voltages are alternately applied to the bases of modulator transistors TR5 and TR6. These transistors share a common constant-current source, comprising transistor TR7 and diode D3 with the DC control transistor TR9.

TR5/9 and TR6/9 therefore act as a long-tail comparators in alternate half-cycles of the oscillator frequency, and when the ramp voltage reaches the level of the control voltage, the current flowing in TR9 is diverted to TR5 or TR6 and then to the drive output transistors TR3 and TR4, which are supplied by the constant-current source of D5-D7, R7 and R107. The width of the output current pulses can therefore be controlled by the DC level appearing at the base of TR9. During the periods when TR9 is on, TR12 is also on and drives TR8 which maintains a clamp across the primary of the drive transformer T2 and also provides a reverse current path for the stored energy in the output transistors TR101 and TR102 during switch-0ff. At switch-on, before the auxiliary voltage has reached its correct level and all control circuits are working properly, resistor R25 holds the DC level of TR9 sufficiently high to ensure that it never turns off during the switching cycle and output drive pulses are inhibited.

When the auxiliary voltage has reached its correct level, zener diode D11 starts to conduct and turns on TR11. This pulls the DC level down to provide the maximum pulse widths consistent with the safety dwell period required to stop simultaneous conduction of transistors TR101 and TR102.

The output voltage of the power supply, as sensed at terminals +S and -S, is taken via potential divider R113, R49 to the input of operational amplifier IC1. Here it is compared with the internally generated reference voltage appearing across zener diode D21. The phasing of IC1 is such that, if the output voltage rises, then the output stage of IC1 is turned on. This drives current into the junction of R25 and R28, raising the DC level into modulator transistor TR9 and reducing the width of the drive pulses to counteract the original rise in output voltage.

The output current of the power supply is sensed by measuring the AC current pulses flowing in the primary of output transformer T5. (The amplitude of this current is proportional to the magnitude of the DC output current.) After transformation and isolation in current transformer T1, the current signal is rectified by diodes D12-D15 and produces a voltage waveform across resistor network R35, R111, R112, R34 and R33. This voltage is buffered, peak detected by TR14 and compared with the internally generated reference voltage appearing across D18 by the error amplifier TR13. Under normal load conditions the voltage generated across R32 is insufficient to turn off TR13 and it remains saturated with diode D10 reverse biased. When the preset overload level is reached, the voltage across R33 makes the base of TR13 sufficiently negative for TR13 to start to turn off. Its collector voltage rises until D10 conducts, and at this point constant output voltage operation ceases and constant output current operation commences with IC1 turned off by the low output voltage and D27 reverse biased. The DC level at the base of TR9 is now controlled by the current amplifier and any tendency for the output current to increase is counteracted by TR13 shutting down the drive pulse width. To provide optimum drive conditions for the output transistors TR101 and TR102, the load current being measured in the current amplifier is used to control the amount of drive current available from the current source R7 by

shunt transistor TR15. At the end of each dwell period, TR8 is on and, via diode D17, holds off TR15. At the start of the conduction period, TR8 turns off but TR15 is held off by capacitor C12 allowing the total available drive current to be used to turn on TR101 and TR102 to minimise turn-on time and dissipation. C12 then charges up via R48 to a voltage level defined by the level across R35 caught by D16 and turns on TR15 to the correct level to shunt away some of the current in R7. This reduces the turn-off time and dissipation of TR101 and TR102.

To protect against over-voltage conditions at the output terminal, the voltage across the +S and -S terminals is monitored in the over-voltage detector TR20. When a preset level is reached, TR20 is turned on, TR19 is turned on and thyristor CSR1 turns on. This shunts all the current from R7 away from the modulator circuit, drive current pulses cease and the output voltage decays to zero. The power supply will remain at zero until the AC supply is switched off and re-applied.

Output Rectifier and Smoothing

Diodes D109 and D110 rectify the voltage output of transformer T5 which is then integrated by inductor L1 and smoothed by capacitor C106. Various other resistors and capacitors provide spike suppression and a bleed load R104 keeps the unit in control at zero output load current.

300W Converter and Control Circuits

Transistors TR101 and TR102, together with capacitors C101 and C102, form a 'half-bridge converter'. The incoming DC power line of approx. 350V is split by capacitors C303 and C321 into +175V and transistors TR301 and TR302 alternately connect the primary of transformer T305 to the +175V and -175V lines. This creates an AC waveform of 175V peak at the primary which is transformed down to the required level at the secondary of T305. Transformer T402, which is in series with the flow of AC current, is a current transformer which is used for overload detection and protection. The control circuit consists of a fixed-frequency, free-running multivibrator comprising transistors TR1 and TR2, capacitors C2 and C3, diodes D1 and D2 and resistors R1-R4, R46 and R47. The time constants of this circuit are designed so that triangular ramp voltages appear at the collectors of TR1 and TR2 and these voltages are alternately applied to the bases of modulator transistors TR5 and TR6. These transistors share a common constant-current source, comprising transistor TR7 and diode D3 with the DC control transistor TR9. TR5/9 and TR6/9 therefore act as long-tail pair operators in alternate half-cycles of the oscillator frequency, and when the ramp voltage reaches the level of the control voltage, the current flowing in TR9 is diverted to TR5 or TR6 and then to the drive output transistors TR3 and TR4, which are supplied by the constant-current source of D5-D7, R7 and R107. The width of the output current pulses can therefore be controlled by the DC level appearing at the base of TR9. During the periods when TR9 is on, TR12 is also on and drives TR8 which maintains a clamp across the primary of the drive transformer T2 and also provides a reverse current path for the stored energy in the output transistors TR301 and TR302 during switch-off. At switch-on, before the auxiliary voltage has reached its correct level and all control circuits are working properly, resistor R25 holds the DC level of TR9 sufficiently high to ensure that it never turns off during the switching cycle and output drive pulses are inhibited. When the

auxiliary voltage has reached its correct level, zener diode D11 starts to conduct and turns on TR11. This pulls the DC level down to provide the maximum pulse widths consistent with the safety dwell period required to stop simultaneous conduction of transistors TR301 and TR302.

The output voltage of the power supply, as sensed at terminals +S and -S, is taken via potential divider R213, R49 to the input of operational amplifier IC1. Here it is compared with the internally generated reference voltage appearing across zener diode D21. The phasing of IC1 is such that, if the output voltage rises, then the output stage of IC1 is turned on. This drives current into the junctions of R25 and R28, raising the DC level into modulator transistor TR9 and reducing the width of the drive pulses to counteract the original rise in output voltage.

The output current of the power supply is sensed by measuring the AC current pulses flowing in the primary of output transformer T305 (the amplitude of this current is proportional to the magnitude of the DC output current). After transformation and isolation in current transformer T202 the current signal is rectified by diodes D12-D15 and produces a voltage waveform across resistor network R35, R111, R11w, R34 and R33. This voltage is buffered, peak detected by TR14 and compared with the internally generated reference voltage appearing across D18 by the error amplifier TR13. Under normal load conditions the voltage generated across R32 is insufficient to turn off TR13 and it remains saturated with transistor TR51 reverse biased. When the preset overload level is reached, the voltage across R32 makes the base of TR13 sufficiently negative for TR13 to start to turn off. Its collector voltage rises until TR51 conducts, and at this point constant output voltage operation ceases and constant output current operation commences with IC1 turned off by the low output voltage and D27 reverse biased. The DC level at the base of TR9 is now controlled by the current amplifier and any tendency for the output current to increase is counteracted by TR13 shutting down the drive pulse width. To provide optimum drive conditions for the output transistors TR301 and TR302, the load current being measured in the current amplifier is used to control the amount of drive current available from the current source R7 by shunt transistor TR15. At the end of each dwell period, TR8 is on and, via diode D17, holds off TR15. At the start of the conduction period, TR8 turns off but TR15 is held off by capacitor C12 allowing the total available drive current to be used to turn on TR301 and TR302 to minimise turn-on time and dissipation. C12 then charges up via R48 to a voltage level defined by the level across R35 caught by D16 and turns on TR15 to the correct level to shunt sway some of the current in R7. This reduces the turn-off time and dissipation of TR301 and TR302. To protect against over-voltage conditions at the output terminal, the voltage across the +S and -S terminals is monitored in the over-voltage detector TR20. When a preset level is reached, TR20 is turned on, TR19 is turned on and thyristor CSR1 turns on. This shunts all the current away from the modulator circuit, drive current pulses cease and the output voltage decays to zero. The power supply will remain at zero until the AC supply is switched off and re-applied.

Output Rectifier and Smoothing

Diodes D309 and D310 rectify the voltage output of transformer T305 which is then integrated by inductor L301 and smoothed by capacitor C306. Various other resistors and capacitors provide spike suppression and a bleed load R304 keeps the unit in control at zero output load current.

500W Converter, Control Circuits and Output Circuits

In all major respects this circuitry is the same as the other MG units and the only differences will be detailed here.

Because of the higher power level two separate converters are used, driven from the same control circuits. TR403, TR404, C403, C404, T1 form one converter, and TR401, TR402, C405, C406, T2 form the other converter. Transformer T401 is a current transformer which measures the AC current flowing in both converters for protection purposes. Two separate sets of output rectifiers and integrating inductors are used which are paralleled together at the output terminals.

The two sets of converter transistors are supplied from separate constant current sources R201, D210 and R202, D211 through drive output transistors TR201 to TR204 and drive transformers T201 and T202. The drive clamp transistor is TR205 and the drive current shunt transistor is TR206 turned off by D206. When the current amplifier TR13 is in control and voltage amplifier IC1 is turned off, amplifier IC2 is turned on and drives current through LED D214, which is fitted on the front panel and indicates an overload condition.

Similarly, when the over-voltage circuit is in operation the conduction of CSR1 turns on LED D215 which is also on the front panel and indicates an over-voltage condition. In this circuit the thyristor CSR1 turns off TR101 which is in series with the zener diode D101, which is controlled by the auxiliary control voltage level. The over-voltage circuit therefore operates by simulating an auxiliary under-voltage level.

At switch-on, during the soft-start of the main reservoir capacitors, the signal from the opto-coupler OC301 (500W rectifier above) is absent, allowing TR52 to be turned on thus shutting the current limit protection circuit down to a low level which inhibits the output of the power supply. At the end of the soft-start period, OC301 is turned on in series with TR207, which is normally held on by R208, and TR52 is turned off. This allows the current reference D18 to rise slowly as C7 charges up and provides a slow ramp-up of output voltage. The same conditions can be simulated externally by the 'Remote Shut-down' signal on terminal block TB2/7 and TB2/8, which turns off TR207 via opto-coupler OC201.

Input Filter

The incoming input voltage is filtered by MFI to remove incoming noise and transients on the supply line. The filter also prevents high-frequency noise generated within the power unit from being transmitted back to the supply line, thus enabling international RFI limits to be met. Fuse FS1 provides protection against major component failure within the unit.

110W and 200W 'C' Models Input Rectifier and Soft Start

MR101 is connected as either a full wave bridge rectifier or a full wave doubler/rectifier supplying capacitors C103 and C121 with their safety bleed resistors R117 and R118. T4 is a small 50/400 Hz transformer which generates an auxiliary voltage across C108 to supply the control circuits. CSR101 is a triac in series with the AC supply line which at switch on is turned off. After C108 has charged and the oscillator starts up, CSR101 is turned on by the winding on T5 shorting out the soft start resistor R119.

MG FUSE RATINGS

UNIT	FUSE RATING	TYPE	PART NUMBE
MG5-20A & C MG12-10A & C MG15-8A & C MG24-4A & C	5A	CERAMIC 1.25 x .25	54871
MG5-20B MG12-10B MG15-8B MG24-5B	2A	CERAMIC 1.25 x .25	55343
MG5-40A & C MG15-16A & C MG24-10A & C MGT5-20A	6A	CERAMIC 1.25 x .25	55345
MG5-40B MG15-16B MG24-10B MGT5-20B	4A	CERAMIC 1.25 x .25	55758
MG5-60A MG24-15A	10A	CERAMIC 1.25 x .25	54783
MG5-60B MG24-15B	5A	CERAMIC 1.25 x .25	54871
MG5-60C MG5-60C	110V 10A 220V 5A	CERAMIC 1.25 x .25 CERAMIC 1.25 x .25	54871 54871
MG24-15C MG24-15C	110V 10A 220V 5A	CERAMIC 1.25 x .25 CERAMIC 1.25 x .25	54783 54871
MG5-100 MG5-100	100V 15A 220V 10A	CERAMIC 1.25 x .25 CERAMIC 1.25 x .25	54870 54783

UNIT TEST PROCEDURE

1. Fit correct supply fuse and set front panel link for correct supply voltage.

2. Proof Voltage Test

After the unit has passed the assembly test it has to be subjected to the full test as laid down below.

Test conditions for all MG units.

Note 1: Input terminals (L and N) to be shorted together and output terminals to be shorted together.

Note 2: The main diodes to be isolated in case of fault which could destroy them.

Note 3: Ensure that capacity is discharged.

Note 4: This unit has been tested for one minute to a high voltage level in accordance with its printed specification. Further testing at that voltage will limit insulation life and will invalidate the guarantee.

Test Procedure for 100W and 200W MGC units.

Apply a voltage of 2100V DC between i/p and earth. Increase this voltage from 0 to 2100V over a period of 20 seconds, maintain for 1 minute. Then slowly reduce to zero and remove test probe.

Test procedure for 300W and 500W MG units.

Gradually apply 1.5 Kv rms over a period of 20 seconds between input and case, 1 Kv rms between output and case simultaneously such that the potential between input and output is 2.5 Kv rms. This should be maintained for a period of 60 seconds, and then reduced to zero over a period of 10 seconds.

3. Insulation Test Input

The input to be s/c and the insulation measured at 500V DC between i/p and earth.

Output. The output terminals should be shorted together. Insulation to be measured at 500V DC between o/p and earth. This test to be carried out after the diodes have been reconnected. Insulation for both input and output to be greater than:-

MG500W Units	50MΩ
Other MG Units	20MΩ

4. Function Test.
Set load to approximately 50% and turn voltage control pot. fully clockwise. Check that output voltage corresponds to the limits shown

in the table below for that position. Then turn the pot. fully clockwise and check against limits for that position:-

Nominal Output	Pot. fully Anti-clockwise	Pot. fully Clockwise
5	<4.7	>5.3
12	<11.4	>12.6
15	<14.25	>15.75
24	<22.7	>25.3

5. Voltage Programming Test

With load resistor set for 50% load, switch off, remove programming link and externally programme with a resistor of appropriate value (5Kohms for 5V units, 12Kohms for 12V units, 15Kohms for 15V units, 24Kohms for 24V units). Outputs shall be within 1% of nominal.

Note: Use 25 ppm =.1% resistors.

5. Overvoltage Test

Using the remote programming facility, programme the o/p voltage until the trip fires. The level shall be for the 100, 200 and 300W units:

Nominal Output	Overvoltage Setting
5V	6.0 - 6.5V
12V	13.8 - 15.0V
15V	16.5 - 18.0V
24V	26.4 - 28.8V

For the 500W Units:

Nominal Ouput	Overvoltage Setting
5V	6.0 - 6.5V
12V	14.25 - 15.75V
15V	17.8 - 19.7V
24V	28.5 - 31.5V

7. Current Limit

Adjust the unit AOT resistor so that the unit current limits as follows:

Unit	Between
MG5-100	110A and 115A
MG12-43	47.3A and 49.5A
MG15-34	37.4A and 39.0A
MG24-21	23.0A and 24.15A
All other MG units	107% and 113% of rated current

Current limit is defined as when the output voltage has dropped by 1V from its nominal value for all output voltages.

8. Efficiency Test

Set load current to nominal, set o/p voltage to nominal and measure efficiency. This should exceed 70% and should typically by 75%.

$$\text{Efficiency} = \frac{\text{Output Watts}}{\text{Input Watts}}$$

9. Ripple and Noise

With load set to full output current, the ripple should be within 10mV RMS and the high frequency spikes within 50mV pk to pk. This test should be carried out using a 30MHz bandwidth 'scope and a high frequency probe.

10. Regulation Test

Change the load from 0% to 100% and the mains from 90% to 110% of nominal. The output voltage shall stay within 0.1% of the set value.

11. Mains Hold-Up Test

Set tap for 220/240V operation and input to 198V. Set the power supply to 105% output voltage and 100% current and the drop-out tester to 1 cycle missing. The output ripple shall not increase by more than 10mV peak under these conditions.

Repeat the test with the tap set for 115/120V operation and the input reduced to 103.5V AC.

12. Soft Start Test

Equipment Required: Storage Oscilloscope
16.5V dc power supply (100-300W units)
15.0V dc power supply (500W units)
0.1R 6W WW resistor connected in series with the input neutral wire

(a) Before connecting mains to the unit connect the dc power supply to the auxiliary rails for about 2 seconds to discharge the main reservoir capacitors.

(b) Set oscilloscope to storage mode, one shot sweep, timebase to 50 msec/div. Monitor the waveform appearing across the O/R resistor in the neutral line. Switch the unit on at the full rated load and observe the stored display. The maximum peak amplitude of the stored waveform shall be:

1V for 100W units
for 200W units
for 300W units
for 500W units

13. Remote Shutdown Test (500W Units)

Equipment required: 5V power supply

Apply 5V to remote shutdown terminals. Overcurrent lamp should come on and the output of the unit should fall to zero. Remove the 5V and the o/p should be restored.

SETTING UP PROCEDURE FOR P.C.B. ASSEMBLIES 63397, 67350 & 65317

Equipment Required:

1. Oscilloscope DC 10MHz Bandwidth
0.5V/cm sensitivity

2. DC power supply setable to:

10V)
16V) ±100mV and 150mA
17.5V)

3. Constant Current Sources:

(a) 1mA ± 2µA
(b) 12.4mA ± 100µA
(c) 2mA ± 5µA

4. Two decade resistance boxes to cover range 100R to 150K.

5. PCB Assy 63397, 67350: two resistors, each 270ohms 1% 1W, connected from Pins 3 and 4 respectively to Pin 1.

6. Edge connector: Gould Advance Part No. PCB Assy 63397,67350-53713
PCB Assy 65317 -54433

Suitable connection wire and probes.

Procedure

1. (PCB Assy 63397, 67350.) Fit 75Kohms ±2% resistor in R47 position. Apply 16V between Pin 1 (+ve) and Pin 6 (-ve) and apply 12.4mA constant current between Pins 19 and 20.

Set oscilloscope to 2V/cm and 1µS/cm with the variable timebase pulled out to give x 5, thus giving 0.2µS/cm sensitivity.

Connect oscilloscope Y1 i/p between Pin 4 and -ve power line, and Y2 i/p between Pin 3 and -ve power line. Oscilloscope trigger should be gated to trigger off the leading edge of Y1 and Y2 waveforms alternately. Adjust R34 so that a single complete pulse of waveforms t1 and t2 is displayed as in Fig. 4.

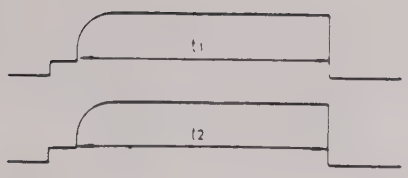


Fig. 4

Select R46 to give a minimum difference in times t1 and t2. This difference should not exceed 0.05µS.

Remove the 12.4mA source.

(PCB Assy. 65317 only): apply 15V between Pin 1 (+ve) and Pin 17 (-ve). Set the oscilloscope for 2V/cm, and connect between emitter of TR9 and -ve power line. The waveform of Fig. 5 should be observed.

Fig. 5

Increase the sensitivity of the oscilloscope to 0.5V/cm and display the peaks of the waveform. Adjust the R46 decade box to minimise the voltage difference between alternate peaks, i.e., reduce V_1. This adjustment should be done with the timebase desynchronised.

Note: The remaining operations (2 to 7) apply to all P.C.B. Assemblies except where a difference is specifically noted.

2. Connect oscilloscope between Pin 3 and -ve power line. Observe the waveform, which should be as Fig. 6 or Fig. 7, whichever is applicable.

Fig. 6 (PC Board 63397 & 67350)

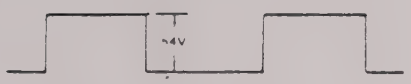


Fig. 7 (PC Board 65317)

3. Connect the oscilloscope between Pin 4 and the -ve power line and check that the same waveform is observed.

Apply 1mA constant current between the following pins:

PCB Assy. 63397, 67350 - Pins 12 and 13
PCB Assy. 65317 - Pins 12 and 2

Select R37 to cause the trailing edge of the pulse to start closing in towards the leading edge. Remove the 1mA source.

4. Apply 12.4mA constant current between Pins 19 and 20. The observed waveform should change to that in Fig. 8 or Fig. 9, whichever is applicable.

Fig. 8 (PC Board 63397, 67350)

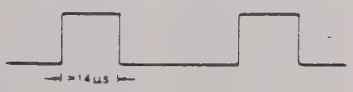


Fig. 9 (PC Board 65317)

Select R 34 to reduce pulse width to 7.5µS ±0.2µS. Remove the 12.4mA source.

5. Apply 2mA constant current between:

PCB Assy. 63397 & 67350 - Pins 7 and 8
PCB Assy. 65317 - Pins 11 and 8

The waveform should now revert to that of Fig 6 or Fig. 7, whichever is appropriate. Select R45 for the lowest value that causes the waveform to collapse. Remove the 2mA source

6. Vary the power to supply 10V and then to 17.5V. Check that there is no degradation of waveform.

7. Reduce power supply to 7V. Check that the oscillation ceases.

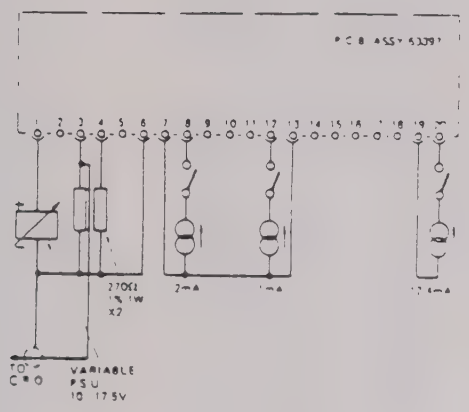


Fig. 10. Test Circuit. PCB Assy 63397, 67350

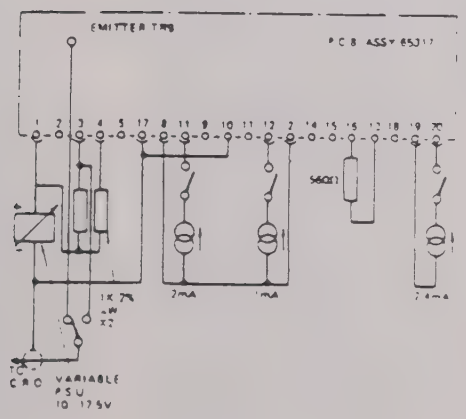


Fig. 11. Test Circuit. PCB Assy 65317

CIRCUIT COMPONENT LIST - 05020270 MG5-40C REV1.POWER SUPPLY

CIRCUIT EFERENCE	PART NUMBER	DESCRIPTION
C0001	00053046	CAPACITOR MP Y GRADE 4N7F
C0002	00053046	CAPACITOR MP Y GRADE 4N7F
C0002	00056839	CAP.C/FILM 6N8F 160V 2.5%
C0003	00054777	CAPACITOR 330N 250V POLYEST
C0003	00056839	CAP.C/FILM 6N8F 160V 2.5%
C0004	00054777	CAPACITOR 330N 250V POLYEST
C0005	00053620	CAPACITOR 22NF 400V POLYCAR
C0005A	00053620	CAPACITOR 22NF 400V POLYCAR
C0006	00052936	CAPACITOR 33UF 10V TANTALUM
C0007	00052936	CAPACITOR 33UF 10V TANTALUM
C0009	00051093	CAPACITOR CER.100NF 25V
C0010	00053784	CAPACITOR 220NF TANTALUM 35
C0012	00022388	CAPACITOR 1N5F 10% CERAMIC
C0013	00054397	CAPACITOR 47NF 25V CERAMIC
C0014	00022369	CAP.27PF 10% CERAMIC 500V
C0020	00054233	CAPACITOR 100UF 3V TANTALUM
C0101	00051121	CAPACITOR MP 1uF 250V
C0102	00051121	CAPACITOR MP 1uF 250V
C0103	00053805	CAPACITOR 480UF 180V AL\EL
C0105	00000774	CAP MF 0.0033UF 400V 10%
C0106	00053572	CAPACITOR 10MF 10V AL\EL
C0106A	00053572	CAPACITOR 10MF 10V AL\EL
C0107	00053106	CAPACITOR TANT 10UF 35V
C0108	00032186	CAPACITOR AL/EL 1000UF 25V
C0109	00022394	CAPACITOR 5N6F 25% CERAMIC
C0110	00022394	CAPACITOR 5N6F 25% CERAMIC
C0111	00031377	CAPACITOR MP 100NF 10% 250V
C0112	00036709	CAPACITOR 0U1F 25V CERAMIC
C0114	00053046	CAPACITOR MP Y GRADE 4N7F
C0119	00055944	CAPACITOR MP 100NF 10% 250V
C0120	00056322	CAPACITOR MP 2200PF 630V
C0121	00053805	CAPACITOR 480UF 180V AL\EL
C0127	00053805	CAPACITOR 480UF 180V AL\EL
C0128	00053805	CAPACITOR 480UF 180V AL\EL
C0130	00054779	CAPACITOR 600N 250V POLYEST
CSR01	00052941	THYRISTOR 2N4146
CSR01	00053457	TRIAC RCA T 2850D
D0001	00023802	DIODE IN4148
D0002	00023802	DIODE IN4148
D0004	00023802	DIODE IN4148
D0005	00023802	DIODE IN4148
D0006	00033923	ZENER DIODE 3.3V 400MW
D0007	00023802	DIODE IN4148
D0008	00023802	DIODE IN4148
D0011	00033931	ZENER DIODE 6.8V 400MW
D0012	00023802	DIODE IN4148
D0013	00023802	DIODE IN4148
D0014	00023802	DIODE IN4148
D0015	00023802	DIODE IN4148
D0016	00023802	DIODE IN4148
D0017	00023802	DIODE IN4148
D0018	00004109	DIODE ZENER 5V6
D0019	00023802	DIODE IN4148
D0020	00023802	DIODE IN4148
D0021	00029601	DIODE ZENER 1N3497 OR 1N825
D0022	00033925	ZENER DIODE 3.9V 400MW
D0023	00023802	DIODE IN4148

CIRCUIT COMPONENT LIST - 05020270 MG5-40C REV1,POWER SUPPLY

CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION
D0025	00052900	DIODE GERMANIUM AA143
D0027	00023802	DIODE IN4148
D0028	00033931	ZENER DIODE 6.8V 400MW
D0109	00054108	DIODE RECTIFIER 40AMP 30V
D0110	00054108	DIODE RECTIFIER 40AMP 30V
FS001	00055345	FUSE 6 AMP
GS001	00061172	GUARD SHIELD TRANSISTOR
IC001	00053549	INTEGRATED CIRCUIT 748C-TO5
IC002	00052940	TRANSISTOR ARRAY
L0001	00064249	CHOKE OUTPUT
L0001	00074976	INDUCTOR FILTER POT (4A)
L0002	00074977	INDUCTOR FILTER (LAM.) 4A
L0003	00074977	INDUCTOR FILTER (LAM.) 4A
MF001	00063772	FILTER UNIT MAINS
MR101	00053098	DIODE BRIDGE MR 756
MR108	00019725	RECTIFIER BRIDGE
R0024	00022484	RESISTOR MO 680R 0.5W 2%
R0025	00038634	RESISTOR MF 47K .25W 2%
R0027	00038594	RESISTOR MF 1K .25W 2%
R0028	00038610	RESISTOR MF 4K7 .25W 2%
R0029	00038604	RESISTOR MF 2K7 .25W 2%
R0030	00038574	RESISTOR MF 150R .25W 2%
R0031	00038546	RESISTOR MF 10R .25W 2%
R0032	00038612	RESISTOR MF 5K6 .25W 2%
R0033	00038612	RESISTOR MF 5K6 .25W 2%
R0034	00055644	A.O.T. RESISTOR
R0035	00022485	RESISTOR MO 620R 0.5W 2%
R0036	00038578	RESISTOR MF 220R .25W 2%
R0037	00055644	A.O.T. RESISTOR
R0038	00038598	RESISTOR MF 1K5 .25W 2%
R0039	00026746	RESISTOR MO 120R 0.5W 2%
R0040	00038602	RESISTOR MF 2K2 .25W 2%
R0041	00038606	RESISTOR MF 3K3 .25W 2%
R0042	00038574	RESISTOR MF 150R .25W 2%
R0043	00038581	RESISTOR MF 300R .25W 2%
R0044	00050786	THERMISTOR TYPE KB
R0045	00055644	A.O.T. RESISTOR
R0046	00028819	RESISTOR MO 75K 0.5K 2%
R0047	00055644	A.O.T. RESISTOR
R0048	00038612	RESISTOR MF 5K6 .25W 2%
R0049	00052950	RESISTOR 6K8 25PPM METAL FI
R0050	00038648	RESISTOR MF 180K .25W 2%
R0051	00038604	RESISTOR MF 2K7 .25W 2%
R0101	00026747	RESISTOR MO 100R 0.5W 2%
R0102	00026747	RESISTOR MO 100R 0.5W 2%
R0103	00003036	RESISTOR WW 68R 6W 5%
R0104	00019803	RESISTOR WW 10R 6W 5%
R0104A	00019803	RESISTOR WW 10R 6W 5%
R0105	00026747	RESISTOR MO 100R 0.5W 2%
R0106	00003229	RESISTOR WW 27R 6W 5%
R0107	00002277	RESISTOR WW 33R 6W 5%
R0108	00054256	RESISTOR MF 2K8 100PPM
R0109	00028781	RESISTOR MO 82R 0.5W 2%
R0110	00022483	RESISTOR MO 5K6 0.5W 2%
R0111	00026737	RESISTOR MO 560R 0.5W 2%
R0112	00055644	A.O.T. RESISTOR
R0113	00052949	RESISTOR MF 4K5 1% 25PPM

CIRCUIT COMPONENT LIST - 05020270 MG5-40C REV1,POWER SUPPLY

CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION
R0117	00028819	RESISTOR MO 75K 0.5K 2%
R0118	00038550	RESISTOR MF 15R .25W 2%
R0119	00019797	RESISTOR WW 18R 6W 5%
R0120	00019802	RESISTOR WW 8K2 6W 5%
R0121	00026747	RESISTOR MO 100R 0.5W 2%
R0122	00026747	RESISTOR MO 100R 0.5W 2%
R0123	00028826	RESISTOR MO 150K 0.5W 2%
R0131	00028822	RESISTOR MO 100K 0.5W 2%
R0132	00028822	RESISTOR MO 100K 0.5W 2%
R0133	00028819	RESISTOR MO 75K 0.5K 2%
RM001	00063478	RESISTOR MODULE
RM002	00063399	RESISTOR MODULE
RM003	00063400	RESISTOR MODULE
T0004	00067296	TRANSFORMER
T0005	00069884	TRANSFORMER-OUTPUT
T1,2	00073944	TRANSFORMER DRIVE ASSY
TB001A	00053955	TERMINAL BLOCK 3WAY
TB001B	00053955	TERMINAL BLOCK 3WAY
TB002	00053958	TERMINAL BLOCK 6WAY
TR001	00023307	TRANSISTOR BSX20 OR 2N2369
TR002	00023307	TRANSISTOR BSX20 OR 2N2369
TR003	00054805	TRANSISTOR ZTX550-K
TR004	00054805	TRANSISTOR ZTX550-K
TR008	00023307	TRANSISTOR BSX20 OR 2N2369
TR011	00026110	TRANSISTOR BC108
TR012	00023354	TRANSISTOR BCY70
TR013	00026110	TRANSISTOR BC108
TR014	00023354	TRANSISTOR BCY70
TR015	00026112	TRANSISTOR BFY50
TR018	00054805	TRANSISTOR ZTX550-K
TR019	00023354	TRANSISTOR BCY70
TR020	00026110	TRANSISTOR BC108
TR051	00054805	TRANSISTOR ZTX550-K
TR101	00062094	TRANSISTOR MATCHED PAIR

CIRCUIT COMPONENT LIST - 05020670 MG15-16C REV 1,POWER SUPPLY

CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION
C0001	00053046	CAPACITOR MP Y GRADE 4N7F
C0002	00053046	CAPACITOR MP Y GRADE 4N7F
C0002	00056839	CAP.C/FILM 6N8F 160V 2.5%
C0003	00054777	CAPACITOR 330N 250V POLYEST
C0003	00056839	CAP.C/FILM 6N8F 160V 2.5%
C0004	00054777	CAPACITOR 330N 250V POLYEST
C0005	00053620	CAPACITOR 22NF 400V POLYCAR
C0005A	00053620	CAPACITOR 22NF 400V POLYCAR
C0006	00052936	CAPACITOR 33UF 10V TANTALUM
C0007	00052936	CAPACITOR 33UF 10V TANTALUM
C0009	00051093	CAPACITOR CER.100NF 25V
C0010	00053784	CAPACITOR 220NF TANTALUM 35
C0012	00022388	CAPACITOR 1N5F 10% CERAMIC
C0013	00054397	CAPACITOR 47NF 25V CERAMIC
C0014	00022369	CAP.27PF 10% CERAMIC 500V
C0020	00054233	CAPACITOR 100UF 3V TANTALUM
C0101	00051121	CAPACITOR MP 1uF 250V
C0102	00051121	CAPACITOR MP 1uF 250V
C0103	00053805	CAPACITOR 480UF 180V AL\EL
C0105	00000774	CAP MF 0.0033UF 400V 10%
C0106	00054214	CAPACITOR 4M7F 25V AL\EL
C0108	00032186	CAPACITOR AL/EL 1000UF 25V
C0109	00022394	CAPACITOR 5N6F 25% CERAMIC
C0110	00022394	CAPACITOR 5N6F 25% CERAMIC
C0111	00031374	CAPACITOR MP 33NF 10% 250V
C0112	00036710	CAPACITOR 100NF CERAMIC 63V
C0114	00053046	CAPACITOR MP Y GRADE 4N7F
C0119	00055944	CAPACITOR MP 100NF 10% 250V
C0120	00000776	CAP MF 0.0047UF 400V 10%
C0121	00053805	CAPACITOR 480UF 180V AL\EL
C0127	00053805	CAPACITOR 480UF 180V AL\EL
C0128	00053805	CAPACITOR 480UF 180V AL\EL
C0130	00054779	CAPACITOR 600N 250V POLYEST
CSR01	00052941	THYRISTOR 2N4146
CSR01	00053457	TRIAC RCA T 2850D
D0001	00023802	DIODE IN4148
D0002	00023802	DIODE IN4148
D0004	00023802	DIODE IN4148
D0005	00023802	DIODE IN4148
D0006	00033923	ZENER DIODE 3.3V 400MW
D0007	00023802	DIODE IN4148
D0008	00023802	DIODE IN4148
D0011	00033931	ZENER DIODE 6.8V 400MW
D0012	00023802	DIODE IN4148
D0013	00023802	DIODE IN4148
D0014	00023802	DIODE IN4148
D0015	00023802	DIODE IN4148
D0016	00023802	DIODE IN4148
D0017	00023802	DIODE IN4148
D0018	00004109	DIODE ZENER 5V6
D0019	00023802	DIODE IN4148
D0020	00023802	DIODE IN4148
D0021	00029601	DIODE ZENER 1N3497 OR 1N825
D0022	00033925	ZENER DIODE 3.9V 400MW
D0023	00023802	DIODE IN4148
D0024	00052900	DIODE GERMANIUM AA143
D0025	00052900	DIODE GERMANIUM AA143

CIRCUIT COMPONENT LIST - 05020670 MG15-16C REV 1,POWER SUPPLY

CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION
D0028	00033931	ZENER DIODE 6.8V 400MW
D0109	00055651	DIODE BYW81-150
D0110	00055651	DIODE BYW81-150
FS001	00055345	FUSE 6 AMP
GS001	00061172	GUARD SHIELD TRANSISTOR
IC001	00053549	INTEGRATED CIRCUIT 748C-T05
IC002	00052940	TRANSISTOR ARRAY
L0001	00064980	CHOKE 16A
L0001	00074976	INDUCTOR FILTER POT (4A)
L0002	00074977	INDUCTOR FILTER (LAM.) 4A
L0003	00074977	INDUCTOR FILTER (LAM.) 4A
MF001	00063772	FILTER UNIT MAINS
MR101	00053098	DIODE BRIDGE MR 756
MR108	00019725	RECTIFIER BRIDGE
R0024	00022484	RESISTOR MO 680R 0.5W 2%
R0025	00038634	RESISTOR MF 47K .25W 2%
R0027	00038594	RESISTOR MF 1K .25W 2%
R0028	00038610	RESISTOR MF 4K7 .25W 2%
R0029	00038604	RESISTOR MF 2K7 .25W 2%
R0030	00038574	RESISTOR MF 150R .25W 2%
R0031	00038546	RESISTOR MF 10R .25W 2%
R0032	00038612	RESISTOR MF 5K6 .25W 2%
R0033	00038612	RESISTOR MF 5K6 .25W 2%
R0034	00055644	A.O.T. RESISTOR
R0035	00022485	RESISTOR MO 620R 0.5W 2%
R0036	00038578	RESISTOR MF 220R .25W 2%
R0037	00055644	A.O.T. RESISTOR
R0038	00038598	RESISTOR MF 1K5 .25W 2%
R0039	00026746	RESISTOR MO 120R 0.5W 2%
R0040	00038602	RESISTOR MF 2K2 .25W 2%
R0041	00038606	RESISTOR MF 3K3 .25W 2%
R0042	00038574	RESISTOR MF 150R .25W 2%
R0043	00038581	RESISTOR MF 300R .25W 2%
R0044	00050786	THERMISTOR TYPE KB
R0045	00055644	A.O.T. RESISTOR
R0046	00028819	RESISTOR MO 75K 0.5K 2%
R0047	00055644	A.O.T. RESISTOR
R0048	00038612	RESISTOR MF 5K6 .25W 2%
R0049	00052950	RESISTOR 6K8 25PPM METAL FI
R0050	00038648	RESISTOR MF 180K .25W 2%
R0051	00038604	RESISTOR MF 2K7 .25W 2%
R0101	00026747	RESISTOR MO 100R 0.5W 2%
R0102	00026747	RESISTOR MO 100R 0.5W 2%
R0103	00003036	RESISTOR WW 68R 6W 5%
R0104	00003036	RESISTOR WW 68R 6W 5%
R0104A	00003036	RESISTOR WW 68R 6W 5%
R0105	00026747	RESISTOR MO 100R 0.5W 2%
R0106	00003229	RESISTOR WW 27R 6W 5%
R0107	00002277	RESISTOR WW 33R 6W 5%
R0108	00028798	RESISTOR MO 8K2 0.5W 2%
R0109	00028781	RESISTOR MO 82R 0.5W 2%
R0110	00022483	RESISTOR MO 5K6 0.5W 2%
R0111	00026752	RESISTOR MO 430R 0.5W 2%
R0112	00055644	A.O.T. RESISTOR
R0113	00053415	RESISTOR 13K 25PPM METAL FI
R0114	00055626	POT 5K CERMET
R0117	00028819	RESISTOR MO 75K 0.5K 2%

CIRCUIT COMPONENT LIST - 05020670 MG15-16C REV 1,POWER SUPPLY

CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION
R0119	00019797	RESISTOR WW 18R 6W 5%
R0120	00019802	RESISTOR WW 8K2 6W 5%
R0121	00026747	RESISTOR MO 100R 0.5W 2%
R0122	00026747	RESISTOR MO 100R 0.5W 2%
R0123	00028826	RESISTOR MO 150K 0.5W 2%
R0131	00028822	RESISTOR MO 100K 0.5W 2%
R0132	00028822	RESISTOR MO 100K 0.5W 2%
R0133	00028819	RESISTOR MO 75K 0.5K 2%
RM001	00063478	RESISTOR MODULE
RM002	00063399	RESISTOR MODULE
RM003	00063400	RESISTOR MODULE
T0004	00067296	TRANSFORMER
T0005	00072040	TRANSFORMER OUTPUT
T1,2	00073944	TRANSFORMER DRIVE ASSY
TB001A	00053955	TERMINAL BLOCK 3WAY
TB001B	00053955	TERMINAL BLOCK 3WAY
TB002	00053958	TERMINAL BLOCK 6WAY
TR001	00023307	TRANSISTOR BSX20 OR 2N2369
TR002	00023307	TRANSISTOR BSX20 OR 2N2369
TR003	00054805	TRANSISTOR ZTX550-K
TR004	00054805	TRANSISTOR ZTX550-K
TR008	00023307	TRANSISTOR BSX20 OR 2N2369
TR011	00026110	TRANSISTOR BC108
TR012	00023354	TRANSISTOR BCY70
TR013	00026110	TRANSISTOR BC108
TR014	00023354	TRANSISTOR BCY70
TR015	00026112	TRANSISTOR BFY50
TR018	00054805	TRANSISTOR ZTX550-K
TR019	00023354	TRANSISTOR BCY70
TR020	00026110	TRANSISTOR BC108
TR051	00054805	TRANSISTOR ZTX550-K
TR101	00062094	TRANSISTOR MATCHED PAIR

CIRCUIT COMPONENT LIST - 05020871 MG24-10C REV1, POWER SUPPLY

CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION
C0001	00053046	CAPACITOR MP Y GRADE 4N7F
C0002	00053046	CAPACITOR MP Y GRADE 4N7F
C0002	00056839	CAP.C/FILM 6N8F 160V 2.5%
C0003	00054777	CAPACITOR 330N 250V POLYEST
C0003	00056839	CAP.C/FILM 6N8F 160V 2.5%
C0004	00054777	CAPACITOR 330N 250V POLYEST
C0005	00053620	CAPACITOR 22NF 400V POLYCAR
C0005A	00053620	CAPACITOR 22NF 400V POLYCAR
C0006	00052936	CAPACITOR 33UF 10V TANTALUM
C0007	00052936	CAPACITOR 33UF 10V TANTALUM
C0009	00051093	CAPACITOR CER.100NF 25V
C0010	00053784	CAPACITOR 220NF TANTALUM 35
C0012	00022388	CAPACITOR 1N5F 10% CERAMIC
C0013	00054397	CAPACITOR 47NF 25V CERAMIC
C0014	00022369	CAP.27PF 10% CERAMIC 500V
C0020	00054233	CAPACITOR 100UF 3V TANTALUM
C0101	00051121	CAPACITOR MP 1uF 250V
C0102	00051121	CAPACITOR MP 1uF 250V
C0103	00053805	CAPACITOR 480UF 180V AL\EL
C0105	00000774	CAP MF 0.0033UF 400V 10%
C0106	00054213	CAPACITOR 3M3F 40V AL\EL
C0106A	00054213	CAPACITOR 3M3F 40V AL\EL
C0107	00036710	CAPACITOR 100NF CERAMIC 63V
C0108	00032186	CAPACITOR AL/EL 1000UF 25V
C0109	00022394	CAPACITOR 5N6F 25% CERAMIC
C0110	00022394	CAPACITOR 5N6F 25% CERAMIC
C0111	00031373	CAPACITOR MP 22NF 10% 250V
C0114	00053046	CAPACITOR MP Y GRADE 4N7F
C0119	00055944	CAPACITOR MP 100NF 10% 250V
C0120	00000769	CAP MF 0.0010UF 400V 10%
C0121	00053805	CAPACITOR 480UF 180V AL\EL
C0122	00022387	CAPACITOR 1NF 10% CERAMIC
C0123	00022387	CAPACITOR 1NF 10% CERAMIC
C0127	00053805	CAPACITOR 480UF 180V AL\EL
C0128	00053805	CAPACITOR 480UF 180V AL\EL
C0130	00054779	CAPACITOR 600N 250V POLYEST
CSR01	00052941	THYRISTOR 2N4146
CSR01	00053457	TRIAC RCA T 2850D
D0001	00023802	DIODE IN4148
D0002	00023802	DIODE IN4148
D0004	00023802	DIODE IN4148
D0005	00023802	DIODE IN4148
D0006	00033923	ZENER DIODE 3.3V 400MW
D0007	00023802	DIODE IN4148
D0008	00023802	DIODE IN4148
D0011	00033931	ZENER DIODE 6.8V 400MW
D0012	00023802	DIODE IN4148
D0013	00023802	DIODE IN4148
D0014	00023802	DIODE IN4148
D0015	00023802	DIODE IN4148
D0016	00023802	DIODE IN4148
D0017	00023802	DIODE IN4148
D0018	00004109	DIODE ZENER 5V6
D0019	00023802	DIODE IN4148
D0020	00023802	DIODE IN4148
D0021	00029601	DIODE ZENER 1N3497 OR 1N825
D0022	00033925	ZENER DIODE 3.9V 400MW

CIRCUIT COMPONENT LIST - 05020871 MG24-10C REV1, POWER SUPPLY

CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION
D0024	00052900	DIODE GERMANIUM AA143
D0025	00052900	DIODE GERMANIUM AA143
D0027	00023802	DIODE IN4148
D0028	00033931	ZENER DIODE 6.8V 400MW
D0109	00055651	DIODE BYW81-150
D0110	00055651	DIODE BYW81-150
FS001	00055345	FUSE 6 AMP
GS001	00061172	GUARD SHIELD TRANSISTOR
IC001	00053549	INTEGRATED CIRCUIT 748C-T05
IC002	00052940	TRANSISTOR ARRAY
L0001	00069970	CHOKE-OUTPUT(10AMP)
L0001	00074976	INDUCTOR FILTER POT (4A)
L0002	00074977	INDUCTOR FILTER (LAM.) 4A
L0003	00074977	INDUCTOR FILTER (LAM.) 4A
MF001	00063772	FILTER UNIT MAINS
MR101	00053098	DIODE BRIDGE MR 756
MR108	00019725	RECTIFIER BRIDGE
R0024	00022484	RESISTOR MO 680R 0.5W 2%
R0025	00038634	RESISTOR MF 47K .25W 2%
R0027	00038594	RESISTOR MF 1K .25W 2%
R0028	00038610	RESISTOR MF 4K7 .25W 2%
R0029	00038604	RESISTOR MF 2K7 .25W 2%
R0030	00038574	RESISTOR MF 150R .25W 2%
R0031	00038546	RESISTOR MF 10R .25W 2%
R0032	00038612	RESISTOR MF 5K6 .25W 2%
R0033	00038612	RESISTOR MF 5K6 .25W 2%
R0034	00055644	A.O.T. RESISTOR
R0035	00022485	RESISTOR MO 620R 0.5W 2%
R0036	00038578	RESISTOR MF 220R .25W 2%
R0037	00055644	A.O.T. RESISTOR
R0038	00038598	RESISTOR MF 1K5 .25W 2%
R0039	00026746	RESISTOR MO 120R 0.5W 2%
R0040	00038602	RESISTOR MF 2K2 .25W 2%
R0041	00038606	RESISTOR MF 3K3 .25W 2%
R0042	00038574	RESISTOR MF 150R .25W 2%
R0043	00038581	RESISTOR MF 300R .25W 2%
R0044	00050786	THERMISTOR TYPE KB
R0045	00055644	A.O.T. RESISTOR
R0046	00028819	RESISTOR MO 75K 0.5K 2%
R0047	00055644	A.O.T. RESISTOR
R0048	00038612	RESISTOR MF 5K6 .25W 2%
R0049	00052950	RESISTOR 6K8 25PPM METAL FI
R0050	00038648	RESISTOR MF 180K .25W 2%
R0051	00038604	RESISTOR MF 2K7 .25W 2%
R0101	00026747	RESISTOR MO 100R 0.5W 2%
R0102	00026747	RESISTOR MO 100R 0.5W 2%
R0103	00003036	RESISTOR WW 68R 6W 5%
R0104	00019641	RESISTOR WW 270R 6W 5%
R0105	00026747	RESISTOR MO 100R 0.5W 2%
R0106	00003229	RESISTOR WW 27R 6W 5%
R0107	00002277	RESISTOR WW 33R 6W 5%
R0108	00056372	RESISTOR MF 13K7 0.5W 25PPM
R0109	00028781	RESISTOR MO 82R 0.5W 2%
R0110	00022483	RESISTOR MO 5K6 0.5W 2%
R0111	00026752	RESISTOR MO 430R 0.5W 2%
R0112	00055644	A.O.T. RESISTOR
R0113	00053424	RESISTOR 21K5 25PPM METAL F

CIRCUIT COMPONENT LIST - 05020871 MG24-10C REV1, POWER SUPPLY

CIRCUIT REFERENCE	PART NUMBER	DESCRIPTION
R0117	00028819	RESISTOR MO 75K 0.5K 2%
R0118	00055403	RESISTOR 100R 2.5W W\W
R0119	00019797	RESISTOR WW 18R 6W 5%
R0120	00019802	RESISTOR WW 8K2 6W 5%
R0121	00026747	RESISTOR MO 100R 0.5W 2%
R0122	00026747	RESISTOR MO 100R 0.5W 2%
R0123	00028826	RESISTOR MO 150K 0.5W 2%
R0131	00028822	RESISTOR MO 100K 0.5W 2%
R0132	00028822	RESISTOR MO 100K 0.5W 2%
R0133	00028819	RESISTOR MO 75K 0.5K 2%
R0134	00028771	RESISTOR MO 10R 0.5W 2%
R0135	00028771	RESISTOR MO 10R 0.5W 2%
RM001	00063478	RESISTOR MODULE
RM002	00063399	RESISTOR MODULE
RM003	00063400	RESISTOR MODULE
T0004	00067296	TRANSFORMER
T0005	00072042	TRANSFORMER OUTPUT
T1,2	00073944	TRANSFORMER DRIVE ASSY
TB001A	00053955	TERMINAL BLOCK 3WAY
TB001B	00053955	TERMINAL BLOCK 3WAY
TB002	00053958	TERMINAL BLOCK 6WAY
TR001	00023307	TRANSISTOR BSX20 OR 2N2369
TR002	00023307	TRANSISTOR BSX20 OR 2N2369
TR003	00054805	TRANSISTOR ZTX550-K
TR004	00054805	TRANSISTOR ZTX550-K
TR008	00023307	TRANSISTOR BSX20 OR 2N2369
TR011	00026110	TRANSISTOR BC108
TR012	00023354	TRANSISTOR BCY70
TR013	00026110	TRANSISTOR BC108
TR014	00023354	TRANSISTOR BCY70
TR015	00026112	TRANSISTOR BFY50
TR018	00054805	TRANSISTOR ZTX550-K
TR019	00023354	TRANSISTOR BCY70
TR020	00026110	TRANSISTOR BC108
TR051	00054805	TRANSISTOR ZTX550-K
TR101	00062094	TRANSISTOR MATCHED PAIR

DRAWING No D 67350

FIRST USED ON MG6

RES.	R1 R2 R40 R47 R3 R4 R6 R7 R9 R25 R27 R10 R32 R33 R35 R48 R11 R50 R13 R14 R43 R45 R5 R8 R24 R18 R28 R29 R16 R30 R31 R34 R36 R37 R49 R38 R39 R40 R42 R44 R20 R21
CAP.	C3 C2 C5A C6 C5 C20 C12 C13 C14 C7 C9 C10
MISC.	D1 TR1 D2 TR2 D3 TR3 D5 D4 D6 D7 TR4 TR5 TR6 TR7 TR8 TR9 D8 D24 D25 TR12 D27 D26 TR11 TR13 TR14 D11 D12 D13 D14 D15 D16 D23 D17 TR15 D18 IC1 D20 D19 TR18 D22 D28 TR19 TR20 D21 C5R1

RM1 RM2 RM3

NOTE:

1 TR5, TR6, TR7, TR9, D3 ARE IN IC2, TYPE 3086F.

2 D28 FITTED TO DC379 AND DC372 ONLY.

FOR COMPONENT SCHEDULE SEE DRG.

DRAWN P.C.J.	CHECKED [illegible]	DIMENSIONS IN INCHES / MILLIMETRES	TOLERANCES (NON-DIMENSIONS) DECIMAL TO 2 PLACES ± .02 DECIMAL TO 3 PLACES ± .010 FRACTIONAL ± 1/64 (METRIC DIMENSIONS) DECIMAL TO 2 PLACES ± 1 mm DECIMAL TO 1 PLACE ± 1 mm WHOLE DIMENSIONS ± 1 mm	ANGULAR ± 1°	MATERIAL	GOULD Advance ©	DRAWING SIZE A1
TRACED [illegible]	APPROVED [illegible]	SCALE NOT TO BE SCALED UNLESS OTHERWISE STATED			FINISH	TITLE CIRCUIT DIAGRAM CONTROL CARD G7350	DRAWING No D 67350 SHEET 1 OF 1
DATE 26-3-79	DATE						

ISSUE 1 26-3-79

ISSUE 2 28-11-79 POINT REMOVED FROM R40 BS 7036

ISSUE 3 24-4-80 D25 ADDED BS 8273

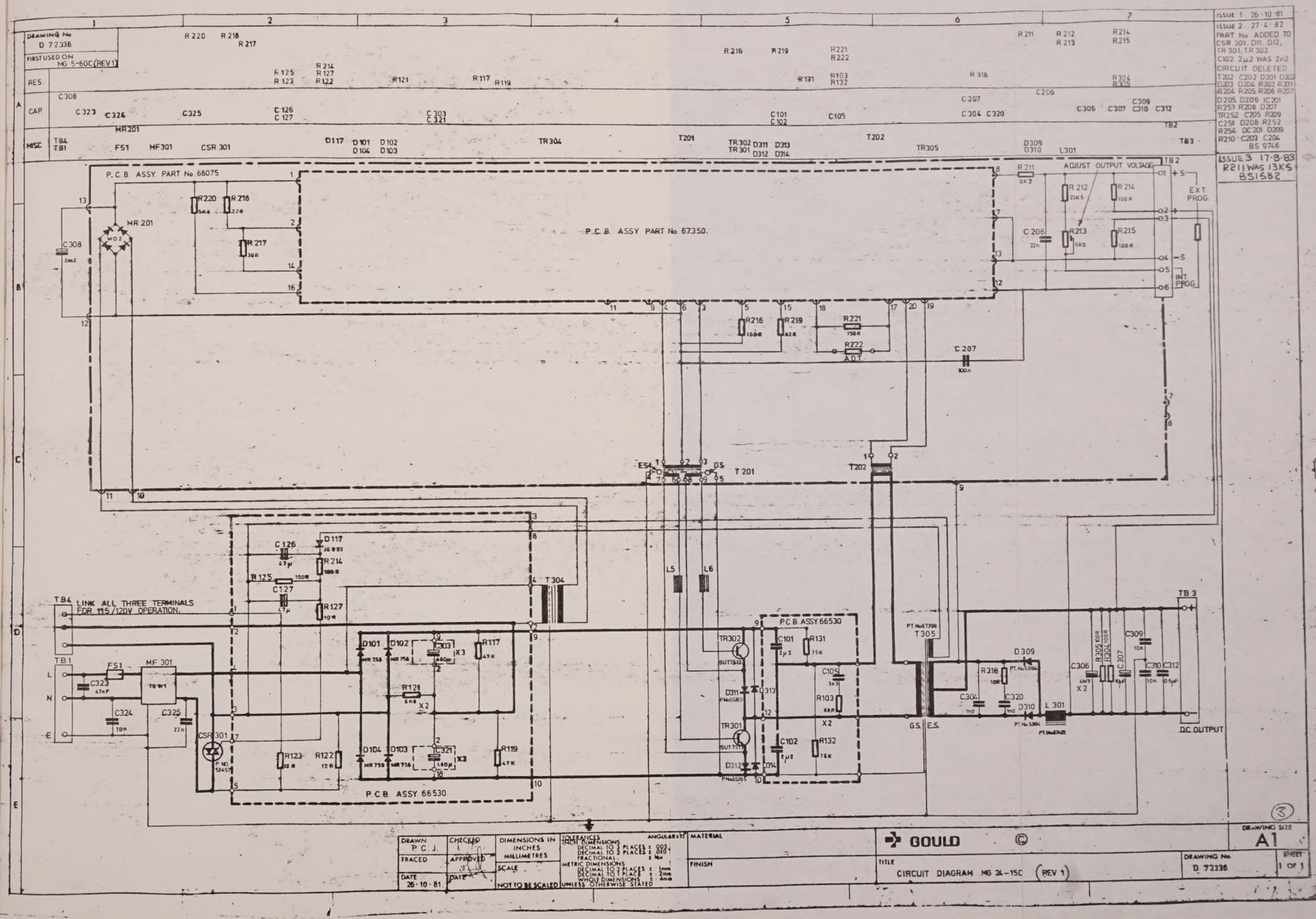
ISSUE 4 27-6-80. DELETED TR18 BCY70. ADDED TR18 ZTX650 C/F BS 8200.

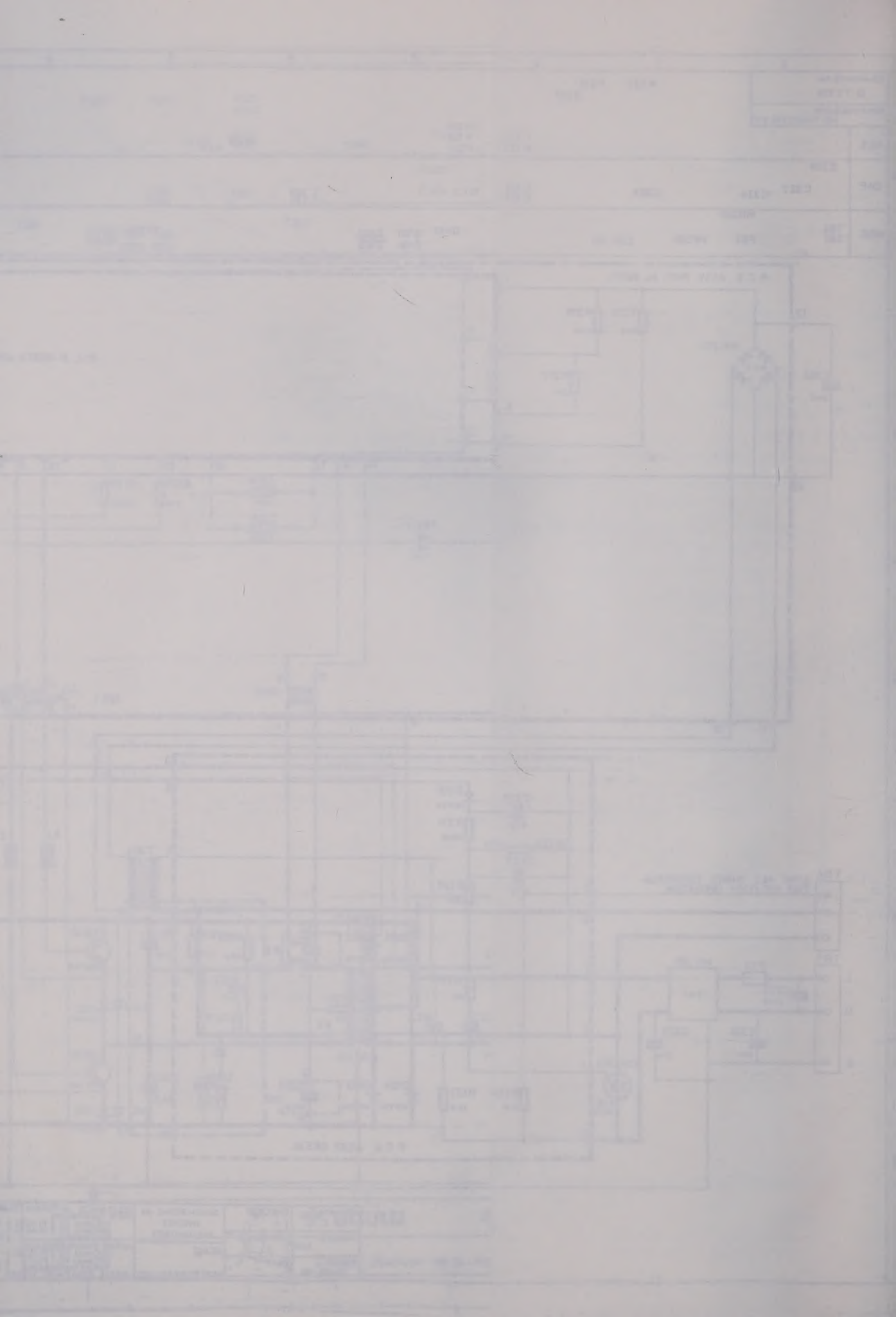
ISSUE 5 20-7-80 R46 75K WAS R46 40T R47 40T WAS R47 75K C/F BS 8332

ISSUE 6 26-2-81 CSA ADDED. C/F BS 8497

ISSUE 7 26-4-82. TR3 TR4 WAS 2N2907A. D19 WAS IN4148 C12 WAS 1nF BS 9745

ISSUE 8 29-9-82 C9 WAS 10nF BS 9168


DRAWING No D 72336
FIRST USED ON MG 5-60C (REV1)
P.C.B. ASSY PART No 68075
P.C.B. ASSY PART No 67350.
P.C.B. ASSY 66530
ADJUST OUTPUT VOLTAGE
EXT PROG.
INT. PROG.
LINK ALL THREE TERMINALS FOR 115/120V OPERATION.
D.C. OUTPUT
ISSUE 1 26-10-81
ISSUE 2 27-4-82
PART No ADDED TO CSR 301, D11, D12, TR 301, TR 302
C102 2µ2 WAS 2n2
CIRCUIT DELETED
ISSUE 3 17-8-83
R211 WAS 13K5
BS1582
GOULD ©
TITLE CIRCUIT DIAGRAM MG 24-15C (REV 1)
DRAWING No D 72336
DRAWING SIZE A1
SHEET 1 OF 1
DRAWN P.C.J.
TRACED
DATE 26-10-81
CHECKED
APPROVED
DATE
DIMENSIONS IN INCHES MILLIMETRES
SCALE
NOT TO BE SCALED
TOLERANCES
INCH DIMENSIONS
DECIMAL TO 3 PLACES ± .005
DECIMAL TO 2 PLACES ± .010
FRACTIONAL ± 1/64
METRIC DIMENSIONS
DECIMAL TO 2 PLACES ± 1mm
DECIMAL TO 1 PLACE ± 2mm
WHOLE DIMENSIONS ± 4mm
ANGULAR ± 1°
UNLESS OTHERWISE STATED
MATERIAL
FINISH



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